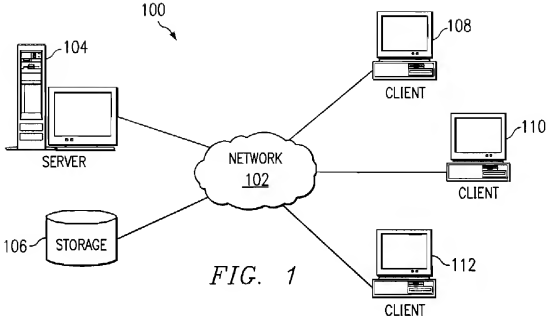

100
104
SERVER
NETWORK
102
108
CLIENT
110
CLIENT
106
STORAGE
112
CLIENT

FIG. 1

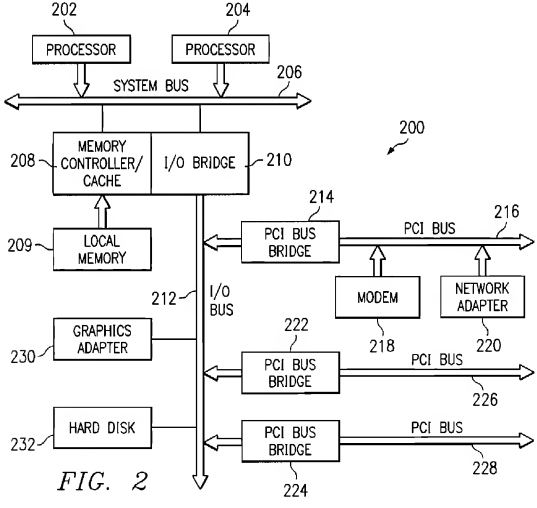

202
204
PROCESSOR
PROCESSOR
SYSTEM BUS
206
200
208
MEMORY CONTROLLER/ CACHE
I/O BRIDGE
210
214
216
PCI BUS
209
LOCAL MEMORY
PCI BUS BRIDGE
PCI BUS
212
I/O BUS
MODEM
NETWORK ADAPTER
222
218
220
230
GRAPHICS ADAPTER
PCI BUS
PCI BUS BRIDGE
226
232
HARD DISK
PCI BUS
PCI BUS BRIDGE
228
224

FIG. 2

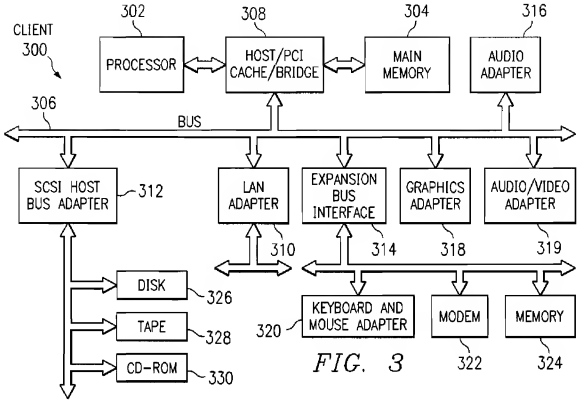

CLIENT
300
302
PROCESSOR
308
HOST/PCI CACHE/BRIDGE
304
MAIN MEMORY
316
AUDIO ADAPTER
306
BUS
SCSI HOST BUS ADAPTER
312
LAN ADAPTER
310
EXPANSION BUS INTERFACE
314
GRAPHICS ADAPTER
318
AUDIO/VIDEO ADAPTER
319
DISK
326
TAPE
328
CD-ROM
330
320
KEYBOARD AND MOUSE ADAPTER
MODEM
322
MEMORY
324

FIG. 3

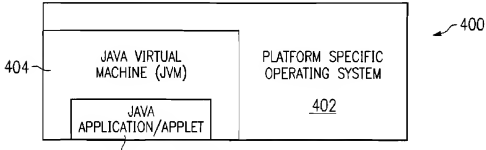
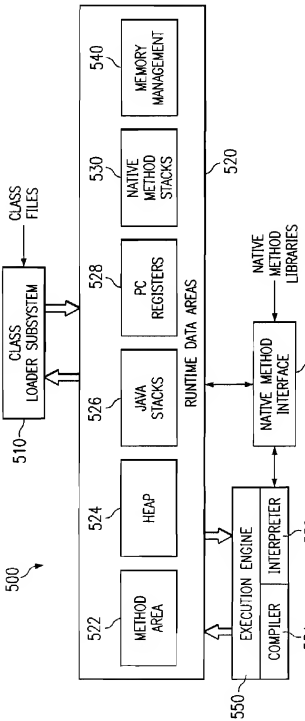

400
404
JAVA VIRTUAL MACHINE (JVM)
PLATFORM SPECIFIC OPERATING SYSTEM
402
JAVA APPLICATION/APPLET
406

FIG. 4

FIG. 5


500
CLASS FILES
CLASS LOADER SUBSYSTEM
510
520
RUNTIME DATA AREAS
METHOD AREA
522
HEAP
524
JAVA STACKS
526
PC REGISTERS
528
NATIVE METHOD STACKS
530
MEMORY MANAGEMENT
540
EXECUTION ENGINE
550
INTERPRETER
552
COMPILER
554
NATIVE METHOD INTERFACE
560
NATIVE METHOD LIBRARIES

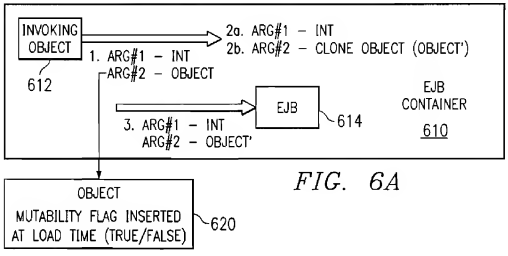


FIG. 6A

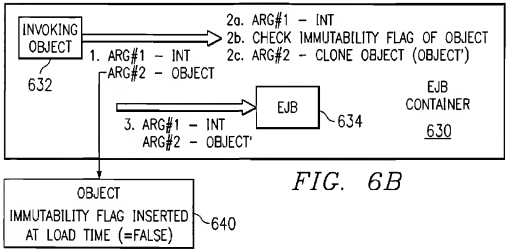


FIG. 6B

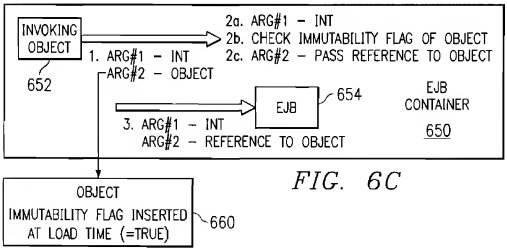


FIG. 6C

FIG. 7

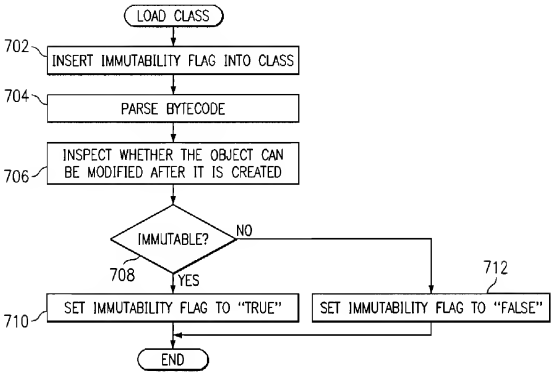
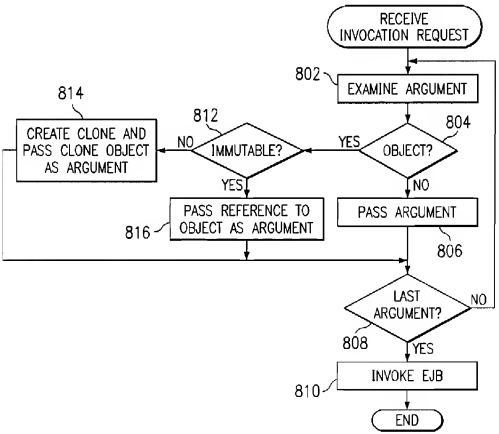

LOAD CLASS
702
INSERT IMMUTABILITY FLAG INTO CLASS
704
PARSE BYTECODE
706
INSPECT WHETHER THE OBJECT CAN BE MODIFIED AFTER IT IS CREATED
IMMUTABLE?
NO
708
YES
712
710
SET IMMUTABILITY FLAG TO "TRUE"
SET IMMUTABILITY FLAG TO "FALSE"
END

FIG. 8


RECEIVE INVOCATION REQUEST
802
EXAMINE ARGUMENT
814
812
804
CREATE CLONE AND PASS CLONE OBJECT AS ARGUMENT
NO
IMMUTABLE?
YES
OBJECT?
YES
NO
PASS REFERENCE TO OBJECT AS ARGUMENT
816
PASS ARGUMENT
806
LAST ARGUMENT?
NO
808
YES
INVOKE EJB
810
END